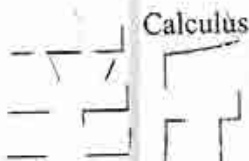


國立暨南國際大學九十二學年度轉學生入學考試試題

第 3 節微積分適用：(應化系二 343)

(本試題共 1 頁，第 1 頁)

- 考生注意：1. 依次序作答，只要標明題號，不必抄題。
2. 答案必須寫在答案卷上，否則不予計分，並限以藍黑色筆作答。
3. 試題隨卷繳回。(餘請詳閱試場規則)



1. (20%) The relationship among the pressure P , volume V and temperature T of a gas or liquid is given by **van der Waal's equation**

$$\left(P + \frac{n^2 a}{V^2}\right)(V - nb) = nRT \quad \text{for positive constants } a, b, n \text{ and } R.$$

Find the critical point (T_c, P_c, V_c) such that $P'(V) = P''(V) = 0$.

2. (10%) Evaluate the following terms:

(a) $\lim_{x \rightarrow 0} \frac{x^3}{\sin x - x}$

(b) $\lim_{x \rightarrow 0} [x^p \cdot \cos(\frac{1}{x})]$

3. (30%) Evaluate the following integrals:

(a)

$$\int_0^{\pi/4} \frac{\sin x}{\cos^2 x} dx$$

(b)

$$\int_{-1}^1 \frac{x}{(x^2 + 1)^2} dx$$

(c)

$$\int_{\pi/4}^{\pi/2} \cot x dx$$

4. (10%) Find the Taylor series for $\sin x$ expanded about $x = \pi/2$.

5. (15%) Determine if the series converges or diverges.

(a)

$$\sum_{k=1}^{\infty} \frac{\sin k + 2}{k^2}$$

(b)

$$\sum_{k=0}^{\infty} (-1)^k \frac{3}{k!}$$

(c)

$$\sum_{k=1}^{\infty} \frac{3}{k^k}$$

6. (15%) Find the volume inside the paraboloid $z = 9 - x^2 - y^2$, outside the cylinder $x^2 + y^2 = 4$ and above the xy -plane

